Procyclical Government Spending:

A Public Choice Analysis

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Abstract: Procyclical government spending occurs when government expenditures increase at a faster rate than income in an economic upturn but fall at a faster rate in a recession. Voracity effects occur when competition for increased spending proves more effective as national income increases. Public choice theory can be applied to describe the distribution of fiscal power across different tiers of government to shed insight into competition for intergovernmental transfers. Politicians have electoral incentives to press for intergovernmental transfers but they also have electoral incentives to signal their ability to manage the economy. With this mix of incentives, the prediction is that intergovernmental transfers will be procyclical and that sub-central government spending will be more procyclical than central government spending. Public choice analysis of pressure for increased public spending predicts a specific pattern of cyclical government spending. This pattern can be observed when analysing government expenditures in 20 OECD countries between 1995 and 2006.

Keywords Business Cycles; Fiscal Policy; Voracity Effects; Volatility.

JEL classification E62; H50; H60; H70

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1. Introduction

The cyclicality of government spending measures the way government spending responds to changes in the output gap. While many commentators (e.g., Alesina et al. 2008) suggest that economists anticipate countercyclicality (i.e. an increase in spending when output falls below potential output), there is evidence of procyclical government spending. Procyclical government expenditure was first reported in Latin America (Gavin et al. 1996) but now there is evidence of procyclical spending in developing countries (e.g., Kaminsky et al. 2004; Talvi and Végh 2005; Woo 2009) and in OECD countries (e.g., Arreaza et al. 1998; Hercowitz and Strawszynski 2004; Lane 2003).

The literature on procyclicality has also focused on the different budgetary items that comprise overall government spending. Lane (2003) reports procyclical spending from capital accounts and procyclical spending on public sector wages in the OECD. Lamo et al. (2007) focus on procyclicality in government consumption (and its main components) in the Euro Area. Darby and Melitz (2008) consider cyclicality in budgets that focus on expenditure (e.g., health) and budgets that focus on redistribution (e.g., incapacity payments; sick pay). Abbott and Jones (2011) find evidence of procyclicality in some functional categories of spending in the OECD (e.g., health, education). Other studies focus on the question of whether expenditures are procyclical if estimates are based on real-time data (i.e. the data that governments rely on when they make decisions), rather than on data that subsequently has been revised (e.g., Cimadomo 2008).

It is not the case that all studies always report procyclical spending (e.g., Fiorito 1997; Forni and Momigliano 2004; Darby and Meltiz 2008) but there are reasons to expect that procyclical spending is more likely in some government budgets than in others (Lane 2003). There are specific reasons for anticipating procyclical sub-central government spending. Revenue streams of sub-central government typically are narrower than central government revenues and sub-central governments have more limited capacity to borrow through credit markets (Arena and Revilla 2009). Sub-central governments are sensitive to the receipt of intergovernmental transfers and to pressures to respond to intergovernmental transfers. Lane (2003) argues that greater consideration should be paid to the

possibility that 'provincial or state government' spending is procyclical and the first objective is to test for procyclicality in sub-central government spending in the OECD.

One explanation for procyclical government spending is that voracity effects exert an influence (Lane and Tornell 1996; Tornell and Lane 1998). When national income increases, political pressure for government spending increases and prudence is relaxed. Voracity effects are more likely if government institutions are weak and if there are significant differences between the preferences of different groups in the economy, e.g., between the preferences of producer groups, consumer groups and ethnic groups (Akitoby et al. 2006).

Lane (2003:2665) argues that "....it is plausible that variation in procyclicality across different expenditure items will be influenced by the .... distribution of fiscal power....". The second objective of this paper is to test the proposition that the 'distribution of fiscal power' increases the likelihood that sub-central government spending will be procyclical. The proposition is that public choice analysis of 'the distribution of fiscal power' sheds insight when predicting patterns of procyclical spending. Lane (2003:2665) refers to the impact of "....other political claimants such as state or provincial governments within a federal system" and the objective is to consider the implications of this impact for patterns of procyclical spending. The intention is to address two questions. Are sub-central government expenditures procyclical? Will public choice theory prove helpful when predicting patterns of procyclical spending across different tiers of government?

Predictions formed with reference to a public choice analysis of the distribution of fiscal power are tested. The model used to test predictions encapsulates changes in the ratio of government spending to GDP in a group of 20 OECD economies between 1995 and 2006. The dependent variables (e.g., sub-central government expenditures and central government expenditures) are regressed on current and lagged values of changes in the output gap and on changes in control variables.

The following section of the paper applies public choice theory to form testable predictions. Section 3 presents the regression model and the data used to test predictions. Section 4 reports the estimation results. Concluding remarks are presented in section 5.

2. The Distribution of Political Influence

If the prevailing expectation is that governments act countercyclically, why might they choose to spend procyclically? Benevolent governments might choose to spend procyclically but the circumstances in which procyclical spending is welfare-maximizing are very specific and, with evidence that voracity effects are relevant, there is usually more than a gentle hint that procyclicality reflects government failure.

Keynesians anticipate that governments will spend countercyclically (to stabilise the economy) but neoclassical economists demonstrate that there are circumstances in which procyclical spending can be justified. If markets are working perfectly, the welfare-maximizing direction of a change of government spending in a neoclassical model depends on the degree of substitutability between government consumption and private consumption. If they are substitutes, government expenditures should be countercyclical. If they are complements, a benign government would increase spending in a procyclical fashion (Lane 2003).

Procyclicality can also be welfare-maximizing if there is market failure. Focusing on developing countries, Alesina et al. (2008) suggest that procyclicality occurs because there are imperfections in financial markets. They note that "....in bad times, many developing countries cannot borrow, or can do so only at very high interest rates, therefore they cannot run deficits and have to cut spending; in booms, they can borrow more easily and choose to do so, increasing public spending...." (p. 1007).

Notwithstanding these scenarios, it is difficult to dismiss the importance of voracity effects. Lane (2003) analyzed the impact of voracity effects on procyclical spending in OECD countries. He used Henisz's (2000) index as a proxy for 'voracity effects'.[1] The index was not relevant for all components of government expenditure, but it was statistically significant when explaining procyclical government consumption and government wage expenditure. He suggested that voracity effects might also be relevant if analysis focused on provincial government expenditures. This paper

[1] Henisz's (2000) index is based on the number of veto points in the process of decision-making and the distribution of differences in preferences for government spending. The first step in compiling the index is to count the number of veto points over policies in branches of government. Voracity effects are likely to be less relevant as this number increases. The index also considers differences in group preferences but voracity effects are likely to more relevant as these increase.

sets out to consider the impact of the 'distribution of fiscal power' across different tiers of government.

The first objective is to apply public choice theory. Public choice scholars analyze the political process as a 'political market' (e.g., Buchanan 1972) in which politicians have an incentive to supply policies to win votes from consumer-voters (see Peacock's 1992 review of this approach). One way to win a majority of votes is to increase public spending by ensuring that the tax costs are borne by a small minority of voters (e.g., the very rich) but whether taxes are borne by a minority of voters or by voters generally, politicians also have an electoral incentive to rely on taxes that appear innocuous. A well-established literature (based on Puviani 1903) indicates that there is 'fiscal illusion'. Empirical studies indicate that voters under-estimate taxation and that they under-estimate some taxes more than others (Dollery and Worthington 1996 and Oates 1988 review this literature).

When collective decision-making depends on a simple majority-voting rule (50%+1), politicians can win the support of specific groups by dissipating the tax costs of expenditure programs across the whole community (Tullock 1959). They can win votes if they provide spending programs that appear to be paid for by other taxpayers. In the *Calculus of Consent* Buchanan and Tullock (1962) focus on the electoral advantage that middle-income voters enjoy because, with their support, the poor are able to press for policies that transfer resources to themselves. In questionnaire studies, the evidence is that voters approve greater spending that requires greater taxation, provided the increased taxation will be paid by others (e.g., Miles et al. 2003).

Politicians are more willing to increase government spending when voters underestimate the tax costs (Buchanan and Wagner 1977). Local politicians are willing to increase public spending when they are in receipt of intergovernmental transfers because intergovernmental transfers mitigate the local tax cost that would otherwise be required to increase public spending. They have electoral incentives to press for intergovernmental transfers from a 'common pool' of central tax revenue because this appears to displace the tax costs on others and contributes to 'fiscal illusion'. It has been argued that competition for intergovernmental transfers produces a 'Leviathan' tendency for increased government spending (Brennan and Buchanan 1980). How will the incentive to compete for

intergovernmental transfers influence the pattern of procyclical spending across different branches of government?

While spending might increase if local voters believe that taxes are paid by others, why would this imply that sub-central government spending might be procyclical? The explanation is based on two arguments. The first is that sub-central spending is more procyclical than anticipated because intergovernmental transfers are more procyclical than anticipated. The second is that the tendency for sub-central government spending to be procyclical is magnified by political pressure to spend more (less) than anticipated when intergovernmental transfers increase (decrease).

2.1. Political Pressure for Intergovernmental Transfers

Local politicians have incentives to compete for intergovernmental transfers that mitigate the need for local taxation. Mueller (2003:223) focuses on these incentives and notes that "....the more the government spends holding taxes constant the happier voters are.…" and "….the higher the probability of incumbent politicians being re-elected….". The implication is that the more countries rely on a tiered structure of government, the smaller each jurisdiction will be and the greater voters in local jurisdictions are likely to feel that intergovernmental transfers are paid for by other taxpayers in the country.

With incentives to win votes, politicians in local jurisdictions press voraciously for intergovernmental transfers when national income increases. When national income increases they are 'leaning against an open door' (because central government tax revenue is increasing). When national income is decreasing, central government is more prudent (because central government tax revenues may fall). The exuberance that accompanies increases in national income and the austerity that accompanies decreases in national income suggest that intergovernmental transfers are likely to be procyclical.

The distribution of fiscal power depends on local politicians' pressure for intergovernmental transfers and central government politicians' ability to respond. The literature on fiscal federalism explains why central governments devolve provision of local public goods to sub-central governments and why they retain responsibility for managing the economy (e.g., Oates 1972). Central governments

are more effective in pursuing that goal than sub-central governments would be. If one local jurisdiction were to attempt to reduce local unemployment by raising spending it would have very little success, because (with open trade between jurisdictions) the local multiplier is small. If sub-central governments were to rely on deficit spending to manage local economies, they would be forced to compete with one another (e.g., by paying higher interest rates to attract loanable funds). In some countries, sub-central governments must operate with a *de facto* balanced-budget rule.

With this assignment, politicians in central governments have electoral incentives to demonstrate that they can manage the economy. In empirical studies, voters indicate that they judge politicians with reference to politicians' personal characteristics and that one of the most important personal attributes is ability to manage the economy (e.g., Jones and Hudson 1996). Voters expect politicians to respond when there is instability and, as Alesina et al. (2008) indicate, the expectation is countercyclical government spending (e.g., an increase in central government current and capital account expenditure when output falls below potential output). In sub-central jurisdictions, politicians' electoral incentive is to press for intergovernmental transfers, but at the central government level, politicians' incentive is to signal that they can manage the economy.

The distribution of fiscal power depends on the change experienced in national income. When there is an increase in national income, local politicians press voraciously for intergovernmental transfers and central government politicians respond because tax revenues are increasing and there is no incentive to signal ability to manage the economy by any increase in other central government current and capital account expenditures. When there is a fall in national income, local politicians may press for intergovernmental transfers but central government politicians' are fearful that tax revenues are likely to fall at the very time that they must signal their willingness to increase other central government current and capital account expenditures. The observation that voters are poorly informed about intergovernmental transfers (e.g., Oates 1979) means that central government politicians are under pressure to increase central government spending on government investment and consumption programs.

The implication is that 'intergovernmental transfers' are a 'swing variable'.[2] As the distribution of fiscal power is sensitive to the way in which national income changes, intergovernmental transfers are greater than expected when national income increases but less than expected when national income falls. Intergovernmental transfers are more procyclical than other central government expenditures.

When national income increases, central government politicians are more willing than expected to increase intergovernmental transfers (because tax revenues are increasing and because there is no incentive to signal that they are managing the economy by increasing other central government current and capital expenditure). When national income falls, they are more austere (because tax revenues may fall and because they must now signal their ability to manage the economy by spending more on central government consumption and on central government investment). In some countries, the same politicians that represent sub-central jurisdictions are also the politicians that collectively signal ability to manage the economy. The same mix of incentives means that, while these politicians press voraciously for intergovernmental transfers when national income increases, they are more concerned about increasing other central government spending when national income falls.

Intergovernmental transfers are likely to be procyclical and more procyclical than central government spending. The implication is that sub-central government spending is likely to be more procyclical than central government spending.

2.2. Political Pressure to Spend Intergovernmental Transfers

While sub-central government spending is likely to be more procyclical than central government expenditure, because intergovernmental transfers are procyclical, there are other public choice arguments suggesting that sub-central government spending will be procyclical. Sub-central government spending is also likely to be more procyclical because sub-central government expenditure increases by more (or falls by more) when there is an increase (or fall) in intergovernmental transfers than when there is an equal increase (or fall) in residents' private income.

[2] We are grateful to an anonymous referee for this terminology.

Hines and Thaler (1995) note that Arthur Okun dubbed this difference the 'flypaper effect'. The implication is that 'money sticks where it hits' (if it is received via the public sector it is spent in the public sector). Bailey and Connolly (1998) illustrate the difference by comparing the income consumption path of a local jurisdiction in receipt of intergovernmental transfers with the income consumption path if private income increases. Both Hines and Thaler (1995) and Bailey and Connolly (1998) review empirical studies that show that the income elasticity of demand is larger when sub-central government are in receipt of intergovernmental transfers (even when intergovernmental transfers take the form of lump sum, non-conditional grants).

Bailey and Connolly (1998) review public choice explanations of the 'flypaper effect'. The receipt of intergovernmental grants (paid for by others in the country) gives local politicians greater freedom to respond to pressures to spend from: local bureaucrats (Niskanen 1971; Romer and Rosenthal 1980); local interest groups (Dougan and Kenyon 1988); and local voters (Oates 1979). The pressures are intense because receipt of the grant means that voters systematically underestimate the tax cost of expenditure programs (Oates 1979).

The implication is that the impact of procyclical intergovernmental transfers on sub-central government spending is magnified when focusing on sub-central government spending. Sub-central government spending will increase (or fall) by far more than anticipated if there is an increase (or fall) in intergovernmental transfers.[3]

A public choice analysis of the distribution of fiscal power (when politicians press for intergovernmental transfers and spend intergovernmental transfers) predicts a specific pattern of procyclicality:

(i) intergovernmental transfers are likely to be procyclical;

(ii) sub-central government expenditures are likely to be procyclical;

(iii) both intergovernmental transfers and sub-central government expenditures are likely to be more procyclical than central government expenditures.

[3] It is important to note that some critics do not observe 'flypaper effects' and that others argue that, if there is a 'flypaper effect', it is not obvious that this has been caused by failings in political processes. Cullis and Jones (2009) review this literature. Here the argument is simply that, in the presence of a (well-documented) flypaper effect the tendency for procyclical sub-central government expenditure is magnified.

3. The Model and the Data

The model used to test these predictions is that presented by Darby and Melitz (2008). Changes in different categories of government expenditure (x_i) as a percentage of national income, $\Delta(x_i/\Upsilon)_t$ are explained as follows:

$$\Delta\left(x_i/\Upsilon\right)_t = \alpha_{0i} + \alpha_{1i}t + \alpha_{ti} + \alpha_{ci} + \beta_{1i}\Delta\left(\Upsilon/\Upsilon^*\right)_t + \beta_{2i}\Delta\pi_t + \beta_{3i}r_{Lt} + \beta_{4i}db_t + \beta_{5i}\Delta\left(\Upsilon/\Upsilon^*\right)_{t-1} + \beta_{6i}\left(x_i/\Upsilon\right)_{t-1} + \beta_{7i}\Delta\left(x_i/\Upsilon\right)_{t-1} + \varepsilon_{ti} \quad (1)$$

where x_i is the i^{th} type of government expenditure, consisting of either central government transfers to sub-central governments; capital and current central government expenditures, sub-central government expenditures, sub-central current and capital government expenditures; or sub-central government spending minus transfers. α_c are the country fixed effects; α_t are time dummies; t is a linear time trend; Υ is annual output; Υ^* is potential output; and therefore (Υ/Υ^*) is the output gap. Like Darby and Melitz (2008) we add two control variables: $\Delta\pi$, which is the change in a country's inflation rate and r_L is the long term interest rate. In addition, given that the cyclicality of spending could depend upon the initial fiscal position of the government sector, we add the debt-GDP ratio (db_t) at time period t.

Following Darby and Melitz (2008), three stage least squares (3SLS) estimation is used to control for the possibility that the output gap is likely to be endogenous with respect to government spending. The output gap, the change in the inflation rate and the interest rate are instrumented to control for the possibility of reciprocal influences of the dependent variable on these series. The instruments include lags of the endogenous variable, oil price inflation, the lagged proportion of the population out of work and change in exports as a percentage of GDP. Lags of the instruments and the time dummies, together with country fixed effects, are included in the instrumented equations. We also test for the robustness of our 3SLS results by re-estimating the equation via a SYS-GMM dynamic panel estimator.

When interpreting the coefficients of equation (1), β_1 estimates the percentage rise in spending arising from a percentage change in the output gap and β_4 estimates the size of the lagged response in spending. $\Delta(\Upsilon/\Upsilon^*)_{t-1}$ is included because spending decisions may take time to respond to changes in the output gap (for example, if there are administrative and implementation lags or lagged responses to voracity effects). Lagged levels and lagged differences of the dependent variable are also included because current changes in spending may be responding to lagged responses of the dependent variable, as reflected in β_5 and β_6. The time trend and lagged level of x_i/Υ are included to control for persistence.

Data on spending by local, state and central tiers of government (including total spending, current spending, and expenditure on capital projects) are available from the IMF's Government Finance statistics database. This source is important because it also provides data on central government transfers to sub-national governments. It was necessary to aggregate data for local and state governments to produce a series for sub-national governments because, for some countries, data are available only for either local government or state government (not for both).

National income data, output gap figures, and the debt-GDP ratio were taken from the OECD Economic Outlook database. There are advantages if real-time data for the output gap are used rather than final data for the output gap (which is sometimes subject to significant revision). If reference is made to real-time data it is possible to model contemporary discretionary fiscal policy responses to the output gap within the same calendar year. The real-time change in the output gap ($\Delta\Upsilon/\Upsilon^*$) is defined as the predicted value of Υ/Υ^* early in a year for the same year minus the concurrent prediction of Υ/Υ^* for the preceding year (Darby and Melitz 2008; Cimadomo 2008). In both instances, the values are those recorded in the December issues of the OECD Economic Outlook. The series for both the inflation rate and the long-term interest rate are also taken from the OECD Economic Outlook database. The sample consists of data for 20 high-income countries over the period 1995-2006.[4] The choice of this sample was restricted by the availability of the intergovernmental

[4] The countries are Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom and the United States.

transfer series. While this is available for most of the high-income OECD countries (excluding notably Australia and Japan), it is published consistently only from 1995 onwards.[5] All series remain in national currencies and are quoted in nominal terms, assuming an identical deflator for both government spending and the output gap.

4. The Empirical Results

Table 1 reports results from the 3SLS estimation of equation (1). In this study, the first considerations are the estimates of β_1 and β_5, which measure the current and lagged response of spending to changes in the real-time output gap.

[Insert Table 1 near here]

In only one of the eight categories of spending, sub-central spending minus transfers, is there evidence of countercyclical spending. This is for the estimated coefficient with reference to the contemporaneous real-time output gap (and the magnitude is -0.613). But when attention focuses on the lagged real-time output gap, there is evidence of procyclicality for total sub-central current spending; sub-central current spending; and intergovernmental transfers. Moreover, there is evidence of a lagged voracity effect with respect to capital spending in the central government sector. With reference to the predicted pattern of cyclicality:

(i) *Intergovernmental transfers are procyclical.* The estimated coefficient for $\Delta(\Upsilon/\Upsilon^*)_{t-1}$ in the intergovernmental transfers column is positive and statistically significant. The estimated coefficient is 0.218.

(ii) *Sub-central government expenditures are procyclical.* The coefficient for $\Delta(\Upsilon/\Upsilon^*)_{t-1}$ is positive and statistically significant with a coefficient of 0.361. The estimate for sub-central government spending implies that a one percentage increase in the lagged output gap raises sub-central government spending by 36.1% of one percentage point. The results also indicate that this

[5] For a few countries (e.g., Greece; Iceland) data are published only for a more limited interval.

procyclicality is driven by the potential votes that are possible if current government spending can be increased; the coefficient for procyclical sub-central current government expenditure (0.352) is also statistically significant.

(iii) *Intergovernmental transfers and sub-central government expenditures are more procyclical than central government expenditures.* The equivalent coefficient for central government spending is -0.082 but this is not statistically significant. It may be that politicians are more likely to focus on countercyclical spending to demonstrate their ability to manage the economy, but they are also sensitive to the possible vote losses that may be incurred if they cut central spending (even when national income increases). Hence the acyclical outcome. There is no evidence of procyclicality for any of the constituent parts of central government spending (with reference to the contemporary output gap or the lagged output gap); the estimates for current spending and capital spending are statistically insignificant. Fiorito and Kollintzas (1994) and Talvi and Végh (2005) also report a statistically insignificant slope estimate for general government expenditure for the G7 (in their case the estimate related to the sum of both central and sub-central spending). [6]

These results are persuasive because so many estimates in Table 1 are consistent with the predicted pattern of cyclicality. However, it is always the case that a set of estimates that support one explanation might also support another (untested) explanation. In Table 1, estimates of procyclicality are based on the lagged output gap and it has been argued that estimates of procyclicality might be influenced by administrative and implementation lags (e.g., see Cimadomo 2008). With the possibility that there might be a configuration of lags that also explains this pattern of results, is it really the case that the test indicates the relevance of voracity effects?

Further support for our conclusions comes from the re-estimation of (1) using the SYS-GMM estimator, the results from which are reported in Table 2. The estimated coefficients are broadly consistent in both sign and magnitude with those reported in Table 1. Procyclicality from $\Delta(\Upsilon/\Upsilon^{*})_{t-1}$ is again reported for total sub-central spending, sub-central current spending, and intergovernmental

[6] Woo (2009) also reports a mean fiscal cyclicality coefficient of 0.176 for the OECD countries, in contrast to a mean coefficient of 0.818 for a sample of developing countries.

transfers, while these new estimates also suggest procyclicality from the contemporaneous and lagged values of $\Delta(\Upsilon/\Upsilon^{*})$ for the current spending of central government and contemporaneous counter-cyclicality for total sub-central government spending.

[Insert Table 2 near here]

While the estimates in Tables 1 and 2 are consistent with the predicted pattern of procyclicality, it is possible to pursue another test to consider whether procyclicality is sensitive to the extent to which countries rely on decentralization. Lane (2003) tested the impact of voracity effects by using Henisz's index as a proxy for voracity effects. Critics question the use of this index (Williams and Siddique 2008) and it is far too general to test the influence exerted by local politicians. The best available indicator of their voracity effect (in the pursuit of intergovernmental grants) is the degree to which a country is decentralized. The best indicator of decentralization is the ratio of central government spending to total government spending (see Hindricks and Myles 2006; Panizza 1999). While this proxy is broader than might be ideal, it is the best available indicator (when focusing on this 'common pool' problem). If it is reasonable to anticipate that voracity effects might increase as the level of decentralization increases, it is far from obvious that administrative and implementation lags will increase as the level of decentralization increases (if there are administrative economies of scale, both of these lags are likely to fall as decentralisation increases).

Turning to this cross-country test, the proposition is that:

$$\hat{\beta}_{5ij} = \alpha + \lambda Z_j + \nu_j \qquad (2)$$

where $\hat{\beta}_{5j}$ are the estimated cyclicality coefficients from a 3SLS regression that includes all the variables in (1) plus a set of country-specific level dummies and country-specific multiplicative dummies that interact with $\Delta(\Upsilon/\Upsilon^{*})_{t-1}$. We thus derive 20 separate estimates for β_{5i}, using the coefficient for $\Delta(\Upsilon/\Upsilon^{*})_{t-1}$ and the coefficients of the multiplicative dummies. Z_j is a set of control variables that includes: the volatility of output, GDP per capita, trade openness, and the ratio of central government spending to total government spending.

The control variables include the best available indicator of local politicians' voracious appetites for intergovernmental grants and variables that proved important in other studies (e.g., Lane

2003). As argued in section 2 of the paper, the more countries rely on a tiered structure of government, the smaller each local jurisdiction will be and the greater the competition for intergovernmental grants (because it appears that the extent to which intergovernmental grants mitigate taxation is even greater). The more countries rely on a tiered structure of government, the more voraciously local politicians press for intergovernmental transfers.

Table 3 presents the results from three sets of regressions. The OLS and Weighted Least Squares regressions assume that decentralization (the proportion of central government spending) is exogenous at any moment of time.[7] The second instruments for the determinants of this measure of fiscal centralization that were reported by Panizza (1999), i.e., for: GDP per capita, land area of the country and population.[8] The estimates are provided for those components of spending where there is evidence of procyclicality in Table 1 (i.e., total sub-central government spending, current sub-central government spending and intergovernmental transfers). The estimates are broadly similar across the various specifications. They suggest an inverse relationship between cyclicality and the central government spending proportion.

[Insert Table 3 near here]

While empirical results are never definitive, the consistency between the results of both of these tests is relevant when assessing the impact of local politicians' voracious appetite for intergovernmental grants.

5. Conclusions

This paper set out to assess the role that public choice theory might play when explaining procyclical government expenditure. While procyclical expenditure might increase welfare, the circumstances in which this is likely are specific and studies emphasize the impact created by voracity effects. Following Lane's (2003) suggestion, this paper focuses on the distribution of fiscal power

[7] We adopt the Weighted Least Squares estimator since the dependent variables are estimated variables, which could lead to potential problems of heteroscedasticity.
[8] These series are taken from the World Bank, World Development Indicators, as are the other control variables used for equation (2). We exclude ethnic fractionalization and democracy, previously suggested by Panizza (1999), since they are likely to be weak instruments for a group of OECD economies.

across different tiers of government. It reports evidence of procyclical expenditure in OECD countries, evidence that is consistent with predictions premised on public choice analysis.

The first conclusion is that there is evidence of procyclical spending by sub-central governments in 20 OECD countries between 1995 and 2006. With Darby and Melitz's (2008) model it is possible to test for procyclicality. Estimates of procyclical intergovernmental transfers and procyclical sub-central government expenditures are reported with reference to the output gap measured in real-time. They are reported with reference to the output gap lagged one period (to allow for the administration and implementation of spending decisions). Central governments' expenditures are acyclical when estimated with reference to contemporary and lagged values of the output gap, but there is a distinct pattern of procyclical sub-central government expenditures.

The second conclusion is that the application of public choice theory makes it possible to introduce a new test for the relevance of voracity effects. This test is whether the pattern of cyclicality matches the pattern predicted by public choice theory. In this paper, the pattern of cyclicality across different tiers of government in a *typical* OECD country resonates with predictions premised on public choice analysis. There was also support for the proposition that voracity effects are relevant when testing the sensitivity of procyclical spending to changes in voracity effects *across* OECD countries (as in Lane 2003).

Both tests suggest that public choice theory offers insight. As well as providing testable predictions:

i) public choice theory explains *why* voracity effects produce procyclical spending. It is not simply the case that competition for intergovernmental transfers ratchets up sub-central government spending. The mix of electoral incentives (e.g., to win intergovernmental grants and to demonstrate ability to manage the economy) means that intergovernmental transfers are greater than anticipated when national income increases but less than anticipated when national income falls. The 'distribution of fiscal power' implies that procyclical intergovernmental transfers increase the tendency for sub–central government expenditures to be procyclical and this tendency (for procyclicality) is magnified when public choice explanations of the flypaper effect are relevant.

ii) public choice theory informs analysis of the *normative* implications of procyclical spending. If voracity effects (competition for public spending) motivate governments, voracity effects may be a desirable *modus operandi* if procyclical expenditures increase welfare. On the other hand, if they reflect distortions in political processes (e.g., the 'common pool' problem and 'fiscal illusion') it is impossible to remain sanguine. This is particularly relevant when considering sub-central government expenditure in the OECD because sub-central government expenditures are growing as a proportion of overall state activity in the OECD (Bergvall et al. 2006).

To our knowledge, this is the first application of public choice theory to analyze procyclical expenditure by different tiers of government. The conclusions suggest that the theory is capable of offering insight into the impact that the distribution of fiscal power across all branches of government exerts on the pattern of cyclicality across all categories of expenditures (e.g., current and capital expenditures on defence, education, social security and other budgetary line items).

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Table 1: 3SLS Estimates

	Sub-central government					Central government		
	Total Spending	Current Spending	Capital Spending	Transfers	Total Spending minus transfers	Total Spending	Current Spending	Capital Spending
α_{0i}	-2.705	-3.092	0.121	-2.959	0.727	13.777*	25.704*	0.606
	(-0.62)	(-0.85)	(0.19)	(-0.90)	(0.25)	(3.21)	(2.10)	(0.68)
t	0.995*	0.903*	0.071	0.623	0.238	-0.582	-0.730	0.075
	(2.39)	(2.69)	(0.83)	(1.84)	(0.86)	(-1.32)	(-0.56)	(0.78)
$\Delta\left(\Upsilon/\Upsilon^{*}\right)_{t}$	-0.653	-0.541*	-0.093	-0.024	-0.613*	0.338	0.884	-0.108
	(-1.85)	(-2.12)	(-0.93)	(-0.08)	(-2.81)	(0.95)	(0.87)	(-1.16)
$\Delta\pi_{t}$	0.336	-0.022	0.011	0.104	-0.098	0.004	-0.017	-0.047
	(0.30)	(-0.24)	(0.64)	(1.21)	(-1.36)	(0.03)	(-0.04)	(-1.82)
r_{Lt}	-0.835	-0.780*	0.016	-0.398	-0.211	0.859	-1.428	-0.283*
	(-1.75)	(-2.14)	(0.14)	(-1.04)	(-0.68)	(1.67)	(-0.90)	(-1.99)
db_{t}	-0.009	0.0005	-0.009*	0.001	-0.002	0.044	0.089	-0.002
	(-0.58)	(0.04)	(-2.29)	(0.08)	(-0.20)	(1.88)	(1.24)	(-0.45)
$\Delta\left(\Upsilon/\Upsilon^{*}\right)_{t-1}$	0.361*	0.304*	0.003	0.218*	0.070	-0.093	0.385	0.049*
	(3.75)	(4.02)	(0.17)	(2.69)	(1.06)	(-0.92)	(1.37)	(2.03)
$\left(x/\Upsilon\right)_{t-1}$	-0.290*	-0.265*	-0.497*	-0.482*	-0.225*	-0.447*	-0.629*	-1.269*
	(-3.35)	(-3.34)	(-3.52)	(-3.70)	(-3.97)	(-4.61)	(-2.19)	(-5.12)
$\Delta\left(x/\Upsilon\right)_{t-1}$	0.122	0.125	0.040	0.265*	-0.136	0.212*	0.038	0.049
	(0.98)	(1.15)	(0.24)	(2.21)	(-1.41)	(2.31)	(0.14)	(0.27)

Note: 3SLS estimates of the cyclicality equation derived instrumenting for the output gap, inflation and interest rate. The equation includes country fixed effects and time dummies not reported to conserve space. * indicates significance at the 5% level.

Table 2: SYS-GMM Estimates

	Sub-central government					Central government		
	Total Spending	Current Spending	Capital Spending	Transfers	Total Spending minus transfers	Total Spending	Current Spending	Capital Spending
α_{0i}	3.762	2.946	1.089	2.475	5.397	18.631*	54.190*	2.540*
	(0.92)	(1.00)	(1.35)	(0.76)	(1.74)	(4.49)	(4.98)	(2.96)
t	0.249	0.221	0.012	0.254	0.069	-0.202	-2.525*	-0.061
	(0.94)	(1.02)	(0.23)	(0.95)	(0.35)	(-0.65)	(-2.98)	(-0.91)
$\Delta\left(\Upsilon/\Upsilon^{*}\right)_{t}$	-0.253*	-0.163*	-0.021	0.006	-0.123*	-0.039	0.594*	0.032
	(-3.06)	(-2.51)	(-1.30)	(0.07)	(-1.99)	(-0.41)	(2.31)	(1.62)
$\Delta\pi_{t}$	-0.100*	-0.081*	0.0004	-0.048	-0.024	-0.012	0.037	0.004
	(-3.19)	(-3.02)	(0.07)	(-1.52)	(-1.00)	(-0.30)	(0.32)	(0.42)
r_{Lt}	0.050	0.016	0.089*	-0.087	0.050	0.317	1.205*	-0.149*
	(0.32)	(0.12)	(2.97)	(-0.51)	(0.42)	(1.83)	(2.39)	(-3.77)
db_{t}	0.015	0.011	-0.011*	-0.015	-0.005	0.129*	0.004	-0.009
	(0.71)	(0.59)	(-2.53)	(-0.77)	(-0.30)	(4.35)	(0.05)	(-1.63)
$\Delta\left(\Upsilon/\Upsilon^{*}\right)_{t-1}$	0.223*	0.203*	0.003	0.242*	0.061	-0.088	0.495*	0.038
	(2.69)	(3.11)	(0.20)	(3.02)	(0.98)	(-0.90)	(1.97)	(1.93)
$\left(x/\Upsilon\right)_{t-1}$	-0.575*	-0.573*	-0.851*	-0.866*	-0.457*	-0.989*	-1.157*	-1.800*
	(-5.72)	(-5.93)	(-9.60)	(-5.71)	(-6.40)	(-9.41)	(-3.79)	(-10.47)
$\Delta\left(x/\Upsilon\right)_{t-1}$	0.034	-0.016	-0.010	0.407*	-0.250*	0.237*	0.180	0.277
	(0.32)	(-0.15)	(-0.13)	(3.00)	(-3.00)	(2.90)	(0.77)	(1.93)
Number of instruments	68	68	68	68	68	68	68	68
Serial Correlation: AR(1)	-1.59	-1.55	-2.29*	-1.61	-2.33	-2.01	-1.70	-2.06*
Serial Correlation: AR(1)	0.41	-0.14	0.91	1.99	-1.33	0.91	0.04	-1.75

Note: Estimates of (1) are derived using a system GMM linear dynamic panel data estimator. The number of instruments displayed refers to the number of lagged values of the regressors (in level and first difference form) that are used as instruments for the explanatory variables. The Arellano-Bond test is used to test for 1st and 2nd order serial correlation in the first difference errors. 1st order serial correlation does not imply model misspecification since the first difference of the errors will be serially correlated. Serial correlation at higher orders should be absent. The estimated equation also includes time dummies (the estimates from which are not reported to conserve space) that account for idiosyncratic time effects. T-ratios are shown in parentheses from robust standard errors. The computation of robust standard errors means the Sargan-Hansen test of over-identifying restrictions is not available, since the test assumes homoscedastic error terms. The equation includes country fixed effects and time dummies not reported to conserve space. * indicates significance at the 5% level.

Table 3: Voracity Equation

	OLS estimates			Weighted Least Squares estimates			IV estimates		
	Total spending	Current spending	Government transfers	Total spending	Current spending	Government transfers	Total spending	Current spending	Government transfers
Central government spending as a proportion of the total	-0.033* (-2.12)	-0.042* (-2.53)	-0.041 (-1.67)	-0.035* (-2.55)	-0.044* (-3.21)	-0.045 (-1.94)	-0.044* (-2.09)	-0.058* (-2.60)	-0.034 (-0.95)
GDP per capita	0.000002* (5.21)	0.000003* (5.94)	0.0000009 (0.90)	0.000002* (3.15)	0.000003* (3.49)	0.000001 (0.77)	0.000002* (2.86)	0.000003* (3.01)	0.0000009 (0.68)
Output volatility	-1.054* (-2.74)	-0.864* (-2.38)	-1.940* (-2.02)	-0.993 (-1.66)	-0.843 (-1.40)	-2.021 (-1.90)	-1.060 (-1.55)	-0.872 (-1.22)	-1.937 (-1.70)
Openness	1.249 (1.12)	0.981 (1.01)	8.557* (5.23)	1.099 (0.95)	0.929 (0.79)	8.929* (4.36)	1.452 (1.09)	1.250 (0.90)	8.441* (3.81)

Note: OLS estimates derived assuming an exogenous central government spending proportion. The Weighted Least Squares regression is estimated where the weighting is proportional to the government spending proportion and we make the adjustment proportional to the absolute value of the residual. The IV estimates instrument the proportion using GDP per capita, land area and population. * indicates significance at the 5% level.